Adding a Shaft

- Right Click on ‘New Design’ and select ‘Shaft’ in Add the dropdown list.

- The ‘Enter Shaft Properties’ window will appear where you can set the shafts length, outer diameter and bore as well as its name.
Adding a Bearing

➢ In the same way as adding the shaft, bearings can be added by right clicking on ‘New Design’ and selecting bearing from the ‘Add’ drop down list.

➢ Multiple bearings can be added at the same time by changing the ‘Number to add’ option.

➢ Add 2 bearings to the model
By selecting the ‘Connect component’ tool in the top right corner of the MASTA window (2 chain links), the bearings can be connected to the shaft.

There are two methods to connect the components. Either select the bearing in the window and drag it onto the shaft or select the bearing in the assembly tree and drag it on to the shaft in the assembly tree.

Connect a bearing at both ends of the shaft.
Moving Components

➢ Once the bearings are connected to the shaft, their axial position can be set.
Choosing a Bearing

➢ By default, the bearing added will be a concept bearing with default stiffness values.

➢ In the properties window, select the ‘Rolling Bearing’ option from the drop down list.
After selecting the type of bearing, the designation of the bearing can be chosen.

Based on the shaft the bearing is connected to, MASTA will enter values for the bore and the outer diameter of the bearing. These can be edited if necessary.

From the 'Type' drop down list. Select 'Radial Ball Bearing'.

Select the SKF 6207 Radial ball bearing.

Further refinement can be achieved if a designation is known or if you have a preferred bearing supplier.

Repeat for the second bearing.
Assemblies

➢ Right Click on ‘New Design’ to add a sub assembly to the assembly tree.

➢ Sub-assemblies can be used to organise the model. Once an analysis has been run, sub-assemblies can be selected to display results for only the components within the sub-assembly.

➢ To move the components, in the assembly tree, drag the shaft and bearings into the sub-assembly.
Duplicating an Assembly

➢ To duplicate an assembly, right click on the assembly in the tree and select the ‘Duplicate’ option in the drop down list.

➢ This will duplicate all components within the assembly as well as the connections between the components.
Adding Gears

- Add a cylindrical gear pair by right clicking on the root assembly.

- Gear geometry details are shown on the following slides.
Initial Gear Specification

1\textsuperscript{st} Gear Stage

2\textsuperscript{nd} Gear Stage
Once a gearset has been initially specified, it is possible to edit in the gear set editor or the properties grid.

These editors are more detailed than the initial editor.
Connect the gears to the shafts in the same way as the bearings (slide 4) and position them to create the model shown above.
Select the X,Y View mode in 2D view

This allows the shaft groups to be offset in the X and Y direction
Select the Input Shaft and set the X,Y positions to 0mm,0mm.
X,Y View – Concentric Group Positions

- Select the Intermediate Shaft
- Change the X position to 89.647mm
- Change the Y Position to 32.629mm
- The Centre Distance will remain at 95.4mm
X,Y View – Concentric Group Positions

➢ Select the Output Shaft

➢ Set the X position to 210mm
The model now has the offset shafts and should look like this.
Shaft Profiling – Input Shaft

- In 2D view, select Shaft Profile mode and ensure ‘Outer’ is selected
- Add new profile points by clicking on the shaft
Shaft Profiling – Input Shaft

Profile points can also be created by right-clicking on the existing points and choosing ‘Add’
Shaft Profiling – Input Shaft

➢ The outer profile points for this shaft are:

<table>
<thead>
<tr>
<th>Outer</th>
<th>Inner</th>
<th>Sections</th>
<th>Surface Finishes</th>
<th>Grooves</th>
<th>Radial Holes</th>
<th>Generic Stress Concentration Factors</th>
</tr>
</thead>
<tbody>
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<td>153.7</td>
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<td></td>
<td>208.208</td>
</tr>
</tbody>
</table>

➢ Repeat this process for the inner profile:

<table>
<thead>
<tr>
<th>Outer</th>
<th>Inner</th>
<th>Sections</th>
<th>Surface Finishes</th>
<th>Grooves</th>
<th>Radial Holes</th>
<th>Generic Stress Concentration Factors</th>
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</thead>
<tbody>
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</tbody>
</table>
Shaft Profiling – Input Shaft

➢ The shaft should now look like this
Shaft Profiling – Output Shaft

➢ Select the Output Shaft and repeat the same process as the input shaft, there is only outer profile on this shaft.

<table>
<thead>
<tr>
<th>Outer</th>
<th>Inner</th>
<th>Sections</th>
<th>Surface Finishes</th>
<th>Grooves</th>
<th>Radial Holes</th>
<th>Generic Stress Concentration Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offset (mm)</td>
<td>0</td>
<td>75</td>
<td>75</td>
<td>117</td>
<td>117</td>
<td>150</td>
</tr>
<tr>
<td>Points</td>
<td>Diameter (mm)</td>
<td>35</td>
<td>35</td>
<td>110</td>
<td>110</td>
<td>35</td>
</tr>
<tr>
<td>Filet Radius (mm)</td>
<td>0</td>
<td>0.5</td>
<td>0</td>
<td>0</td>
<td>0.5</td>
<td>0</td>
</tr>
</tbody>
</table>

Import from Clipboard Import
Shaft Profiling – Output Shaft

➢ The output shaft looks like this
Power Loads

- Add 2 Power Loads to the model
- These components allow Speed and Torque to be added to the system
- There is an Input Power Load and an Output Power Load
Connect the Power Loads to the Input and Output shafts. The design is complete.
Load Cases

- Add 3 load cases as named below by using the ‘Add Load Case’ button.

- Renaming can be done using F2 or triple clicking.
➢ Set Speed and Torque value as per the example
4 – Power Flow and System Deflection
Thank you for your attention